## Reduced wiring system

EtherNet/IP™ Compatible SI Unit

# Instruction Manual

EX250-SEN1


EtherNet/IP™

**SMC Corporation** URL http://www.smcworld.com

Thank you for purchasing the SMC reduced wiring system EX250 series.
Please read this instruction manual carefully and understand the contents before use so that you can operate this unit safely and correctly.
Please keep this manual handy for future reference.

## OPERATOR

- This instruction manual has been written for those who have knowledge of machines and equipments that use reduced wiring system as well as the sufficient knowledge to assemble, operate, and maintain such devices.
- Before performing assembly, operation and/or maintenance, please read this manual carefully and understand the contents.



# Contents

# SAFETY

The body of unit and this manual contain the essential information for the protection of users and others from possible injury and property damage and to ensure correct handling.
Please check that you fully understand the definitions of the following messages ( symbols ) before going on to read the body of this manual, and always follow the instructions.
Please also read the instruction manuals etc. of related machines and equipments and understand the contents before use.

| IMPORTANT MESSAGES | |
|---|---|
| Read this manual and follow its instructions. Signal words such as WARNING, CAUTION and NOTE will be followed by important safety information that must be carefully reviewed. | |
| ⚠WARNING | Indicates a potentially hazardous situation that could result in death or severe injury if you do not follow instructions. |
| ⚠CAUTION | Indicates a potentially hazardous situation that, if not avoided, may result in minor injury or moderate injury. |
| NOTE | Gives you helpful information. |

## ⚠WARNING

**Do not disassemble,**
**modify ( including modification of printed circuit board ) or repair.**

Otherwise injury or failure can result.

**Do not operate beyond specification range.**

Otherwise fire, malfunction or damage to the reduced wiring system can result.
Confirm the specifications before operation.

**Do not operate in atmosphere of flammable/explosive/corrosive gas.**

Otherwise fire, explosion or corrosion can result.
This reduced wiring system is not explosion-proof type.

**For use in interlock circuit:**
- **Provide double interlock system by adding different type of protection ( such as mechanical protection ).**
- **Check that the interlock circuit is working normally.**

Otherwise accident caused by malfunction can result.

## ⚠WARNING

**Before performing maintenance:**
- **Turn off power supply.**
- **Stop air supply, exhaust compressed air in piping, and confirm the release to atmosphere.**

Otherwise injury can result.

## ⚠CAUTION

**Conduct proper functional inspection after completing maintenance.**

In the case of abnormality such as unit does not work normally, stop the operation.
Otherwise safety cannot be assured due to unintended malfunction.

**Provide grounding to improve safety and noise resistance of reduced wiring system.**

Provide grounding as close to the unit as possible to shorten distance for grounding.

### ●Handling precautions

Use the following UL-recognized DC power supply to combine with.

1. UL508-compatible limited voltage/current circuit
   A circuit using the secondary coil of an insulating transformer that meets following conditions as power source.
   - Maximum voltage ( at no load ) : 30Vrms ( 42.4Vpeak ) or below
   - Maximum current: ( 1 ) 8A or less ( including when short-circuited )
     ( 2 ) When limited by the circuit protector ( such as fuse ) having the following rating.

| No-Load Voltage ( Vpeak ) | Max. Current Rating ( A ) |
|---|---|
| 0 to 20 [V] | 5.0 |
| Above 20 [V] to 30 [V] | 100/peak voltage |

2. UL1310-compatible Class 2 power supply unit or circuit of max. 30Vrms ( 42.4Vpeak ) or less using a UL1585-compatible Class 2 transformer as power source. ( Class 2 circuit )

## SAFETY ( continued )

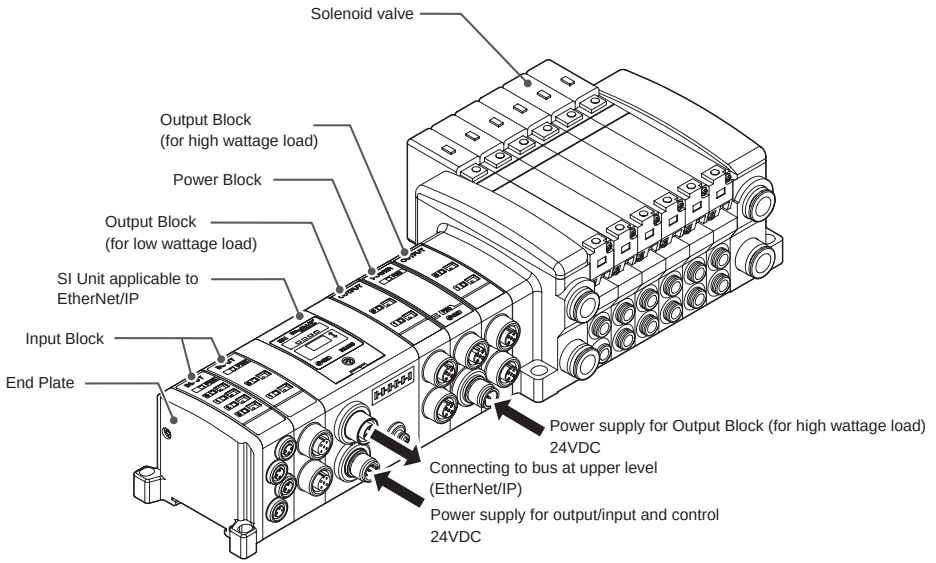
**Follow the instructions given below when handling your reduced wiring system. Otherwise a damage or failure to cause a malfunction can result.**

- Operate the reduced wiring system at the specified voltage.
- Reserve space for maintenance.
- Do not remove any name plate or label.
- Do not drop, hit or apply an excessive shock to the unit.
- Follow the specified tightening torque.
- Do not apply any excessive force to cables by repeated bending, tensioning or placing a heavy object on the cables.
- Connect wires and cables correctly.
- Do not perform any wiring work while the power is on.
- Do not use the reduced wiring system on the same wiring route as the power line or high voltage line.
- Confirm the insulation of wiring.
- Perform the power supply wiring by dividing into two lines — one is for power supply for output and the other is for power supply for input and controlling.
- Take sufficient measures against noise such as noise filter when incorporating the reduced wiring system into a machine or equipment.
- Mount a Waterproof Cap on each unused M12 connector for input/output.
- Take sufficient shielding measures when operating the product in any of the following places.
  ( 1 ) A place where noise due to static electricity etc. is generated
  ( 2 ) A place of high electric field strength
  ( 3 ) A place where exposure to radioactivity is possible
  ( 4 ) A place near power cable
- Do not operate the product in a place where there is a source of surge.
- Use a surge absorbing element built-in type to directly drive the load that generates surge voltage such as solenoid valve.
- Prevent any foreign matter such as remnant of wires from getting inside the product when opening the station number switch protective cover.
- Install the reduced wiring system in a place free from vibration and impact.
- Operate the product in the specified ambient temperature range.
- Do not use in a place to be affected by the radiant heat from a surrounding heat source.
- Set the DIP switch by using a sharp-pointed watchmakers screwdriver etc.
- Perform the maintenance regularly.
- Conduct an appropriate functional inspection after completing the maintenance.
- Do not use chemicals such as benzin and thinner to clean the product.



# Product Summary

## ●System configuration general




This system realizes reduced wiring between the input and output equipment by connecting to EtherNet/IP. EtherNet/IP and the input and output equipment communicates through the SI Unit.

Up to 32 Inputs can be connected to the SI Unit using Input Blocks.

Up to 32 Outputs Note) from combined EX9 Output Blocks and Valve manifolds can be connected to the SI Unit.

Note) The maximum output point is 24 when the Power Block is connected.

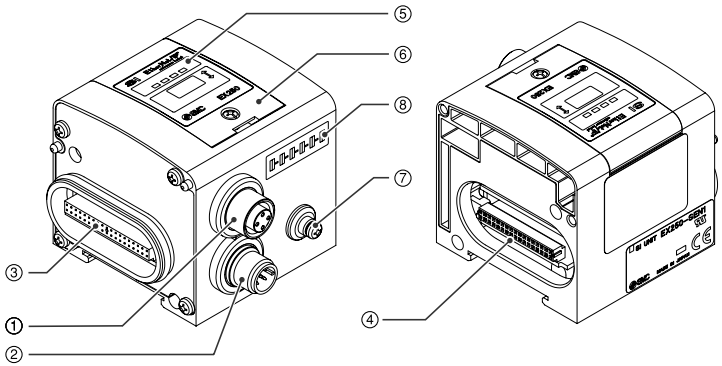
## SI Unit Model Indication Method

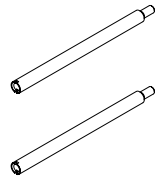
**EX250 – SEN1**

Communication protocol

| | |
|---|---|
| EN1 | EtherNet/IP |

## Part Names



Tie-rod (2 pcs.)
Accessory

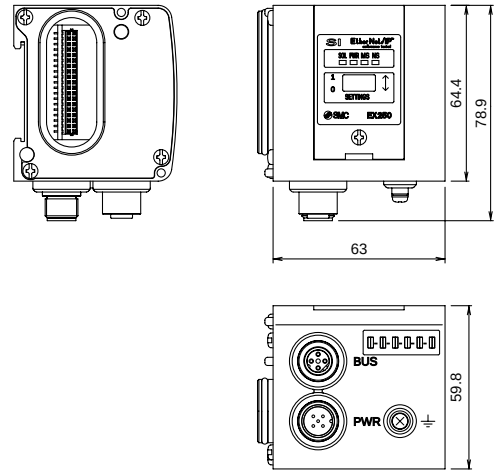
| No. | Part names | Application |
|---|---|---|
| 1 | Communication connector | Connect with EtherNet/IP line. Note1) |
| 2 | Power supply connector | Supplies power to the solenoid valve, the Output Block, SI Unit and the Input Block. Note1) |
| 3 | Input Block connector | Connects the Input Block. |
| 4 | Output Block connector | Connects the solenoid valve, Output Block and etc. |
| 5 | Display | LED display shows the SI Unit status. Note2) |
| 6 | Switch protective cover | Display the power supply status and communication status with PLC. Note2) |
| 7 | Ground terminal | Used for grounding. |
| 8 | MAC address | A unique MAC address of 12 hexadecimal number digits to each SI Unit. |

Note1 : For wiring method, refer to subsection "Wiring" (page 12) in this manual.
Note2 : For display and setting method, refer to subsection "Display/Setting" (page 15) in this manual.



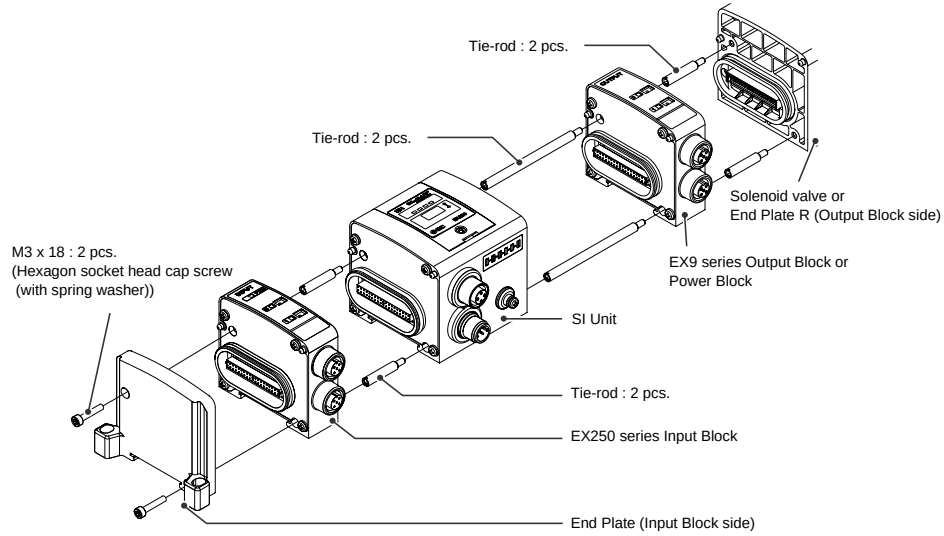
## Dimensions ( unit : mm )

**●SI Unit body**




## Mounting/Installation

**How to assemble / disassemble units.**




**NOTE**
Hold the SI Unit and the Input / Output Block in order to have no clearance between them while tightening the bolt.
Be sure to tighten bolt by specified tightening torque. (Tightening torque : 0.6N•m)

## ●Layout of the Input Block

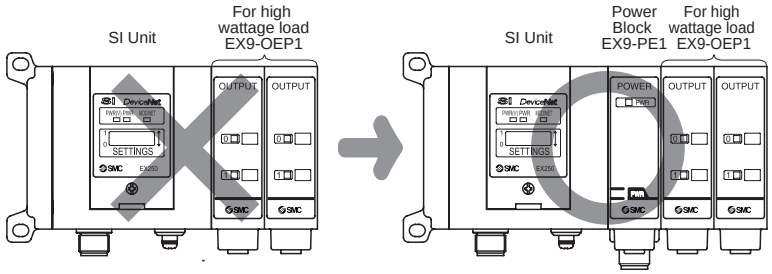
- Position the Input Block on the left side of the SI Unit.

## ●Layout of the EX9 series Output Block / Power Block

Position the Output Block / Power Block on the right side of the SI Unit and between the SI Unit and solenoid valve or End Plate R (on the Output Block side).

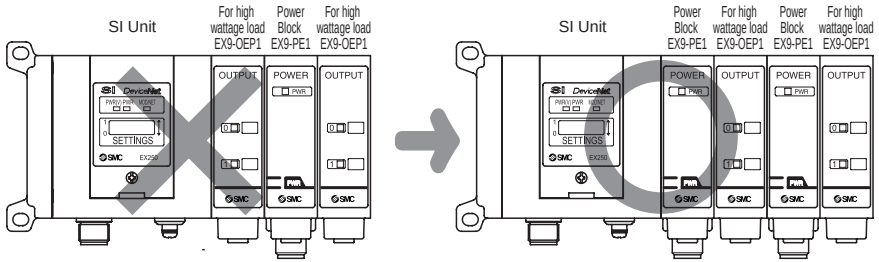
1) Output Block for high wattage load

- The Output Block for high wattage load cannot be used independently. Be sure to combine with the Power Block for use.



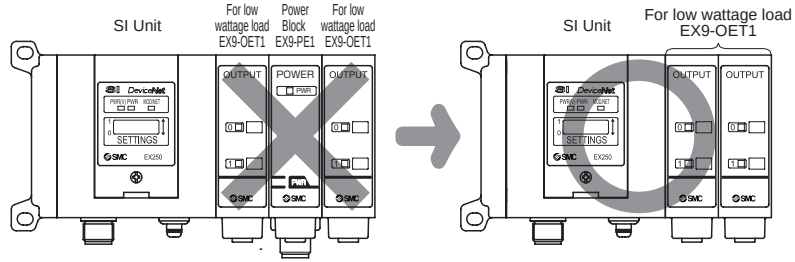

2) Position of Output Block for high wattage load

- The Output Block for high wattage load cannot be mounted at the place nearer to the SI Unit than the Power Block. However, that place is acceptable if the Power Block is located between SI Unit and the Output Block for high wattage load.




3) Output Block for low wattage load

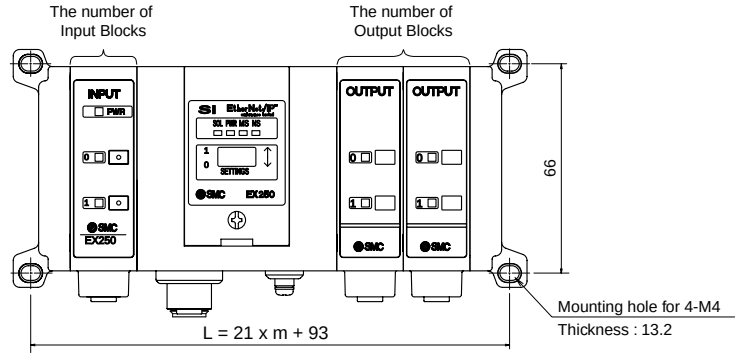
- The Output Block for low wattage load cannot be mounted at the right side of the Power Block. Mount to the place nearer to the SI Unit than the Power Block.




## ● Position of End Plate

- Be sure to connect the End Plate (on the Input Block side) at the left end of the manifold.
- When the valve is not connected, be sure to connect the End Plate R (on the Output Block side) at the right end of the manifold.

## ●Installation example Dimensions with solenoid valves unconnected [Unit: mm]




* The number of Input Blocks + The number of Output Blocks + The number of Power Blocks : m

| L \ m | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| L | 114 | 135 | 156 | 177 | 198 | 219 | 240 | 261 | 282 | 303 |

[mm]

* Each dimension shows the unit without solenoid valves connected and with an End Plate R (on the Output Block side) connected. Standard settings of L dimensions are with 10 or less m blocks. Ask SMC sales for the setting with over 10 blocks mounted.
Refer to the individual specifications for the dimensions when the solenoid valves are connected.

Wiring (power supply, communication, input/output) and piping are all in one direction. Space for wiring and piping is required in that direction.

# Specifications

## ●Basic specifications

| | |
|---|---|
| Rated voltage | 24VDC |
| Range of power supply voltage | Power supply for input and control : 24VDC± 10%<br>Power supply for output : 24VDC+10%/-5% |
| Rated current | Power supply for input and control : Max. 1.1A<br>( Inside SI Unit : 0.1A<br>Input device :1A )<br>Power supply for output : Max. 2A |
| Number of input/ output points | Input point : Max. 32/Output point : Max. 32 * |
| Output type | PNP output (-COM.) |

* The maximum output point is 24 when the Power Block is connected.

## ●Higher-level bus

| | | |
|---|---|---|
| Protocol | | Ethernet (IEEE802.3) |
| | Media | 100BASE-TX |
| | Communication speed | 10M/100Mbps (Automatic selection or manual setting) |
| | Max. segment length | 100m (328ft) |
| | Max. transceiver number | 2 (per segment) |
| | Communication method | Full duplex/Half duplex (automatic selection or manual setting) |
| Fieldbus protocol | | EtherNet/IP™ Release1.0 |
| | I/O message | Input : Data length 6 byte, Instance 100.<br>Output : Data length 4 byte, Instance 150. |
| | Port No. | 44818 (0xAF12) |
| IP address setting range | | 192.168.0.1 to 192.168.0.14 (Setting by an internal switch)<br>Or optional setting by the DHCP server |
| Device information | | Vendor ID : 7 (SMC Corp.)<br>Product type : 12 (communication adapter)<br>Product code : 107 |

## ●I/O mapping

Input area mapping

| Offset (word) | Input data | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSB | | | | | | | LSB | MSB | | | | | | | LSB |
| | 15 | | | | | | | 8 | 7 | | | | | | | 0 |
| 0 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 1 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |
| 2 | L | L | L | L | SP | DI | L | L | L | L | L | L | L | L | L | L |

Sensor input area

Status input area

L : Fixed to Low

Diagnostics (Status input area)

| Item | Status | Condition | |
|---|---|---|---|
| SP | Solenoid power supply status | 0 | No supply voltage |
| | | 1 | Supply voltage OK |
| DI | Status of sensor power supply | 0 | Short circuit |
| | | 1 | Normal |

Output area mapping

| Offset (word) | Output data | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MSB | | | | | | | LSB | MSB | | | | | | | LSB |
| | 15 | | | | | | | 8 | 7 | | | | | | | 0 |
| 0 | 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 1 | 31 | 30 | 29 | 28 | 27 | 26 | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 |

# Wiring

## ①Communication wiring

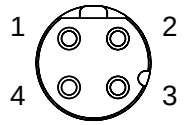
Connect the Ethernet Communication Cable to the communication connector of SI Unit.

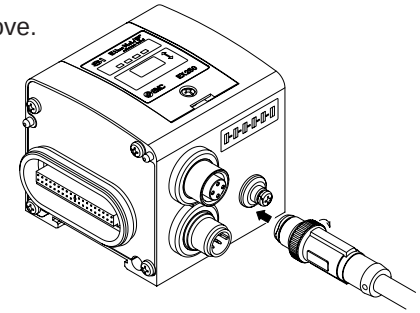
### Cable connection

(1) Aligning the key groove with the communication connector (4-pin, socket) of SI Unit, plug the Ethernet Communication Cable (plug).

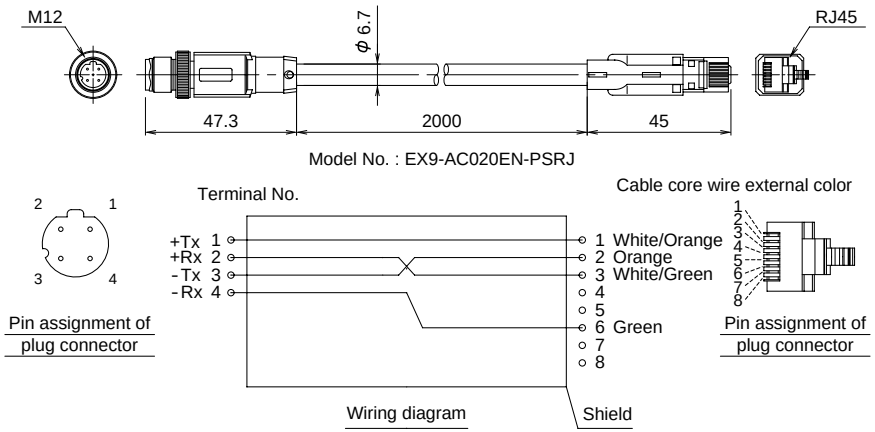
(2) Tighten the lock nut on cable side by turning it clockwise by hand.

(3) Confirm that the connector portion does not move.



### Pin layout and connection diagram of Ethernet Communication Cable




| Cable specifications | |
|---|---|
| Core wire | AWG 26 |
| Sheath color | Blue green |

## ②Power supply wiring

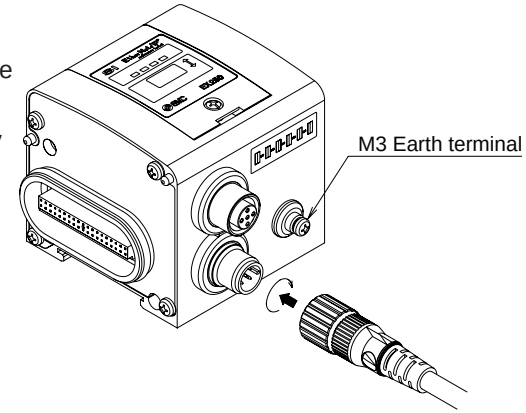
Connect the Power Supply Cable to the power supply connector of SI Unit.
When selecting the power supply, refer to "Handling precautions" (page 3) in this manual.

### Cable connection

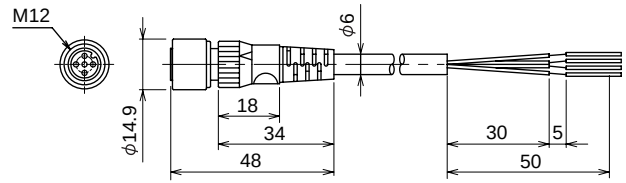
(1) Aligning the key groove with the power supply connector (plug) of SI Unit, plug the Power Supply Cable (socket).

(2) Tighten the lock nut on cable side by turning it clockwise by hand.

(3) Confirm that the connector portion does not move.

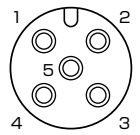



### Pin layout and connection diagram of power supply connector cable for (unit : mm)




Model No. : EX500-AP□-S

| Pin No. | Cable color: Signal name |
|---|---|
| 1 | Brown : 24VDC +10%/-5% (for solenoid valves/output) |
| 2 | White : 0V (for solenoid valves/output) |
| 3 | Blue : 24VDC ± 10% (for input and control) |
| 4 | Black : 0V (for input and control) |
| 5 | Grey : Earth |




Socket connector pin layout

**NOTE**

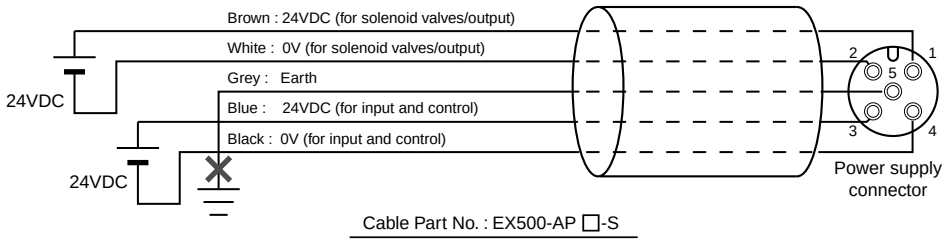
Ground the Earth terminal with the ground resistance at 100 ohm or less. Make the pin No.5 of the power supply connector ungrounded, and ground at one point.

## Wiring ( continued )

### Connecting one or two power supplies to SI Unit.

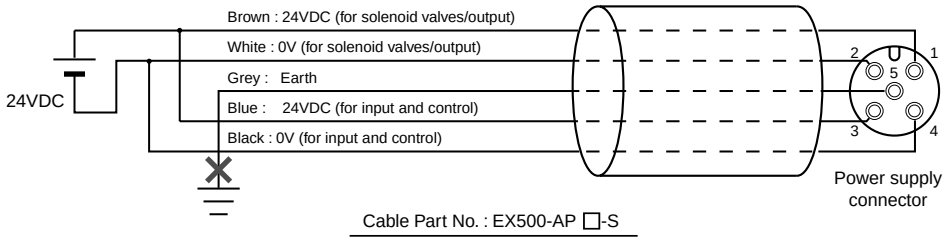
Both single power supply and two power supply systems can be adopted, however, the wiring shall be made separately (for solenoid valves/output and for input and control) for either system.

A. Two power supplies




Cable Part No. : EX500-AP □-S

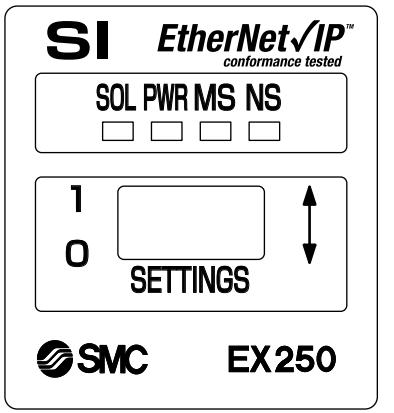
B. Single power supply




Cable Part No. : EX500-AP □-S

## Display/Setting

### ●Settings for display

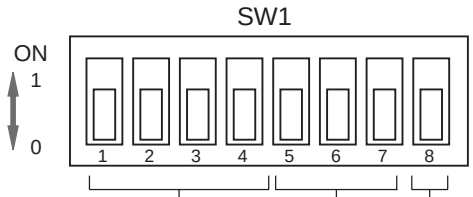



| Display | Contents | |
|---|---|---|
| SOL | OFF | The power supply for solenoids is insufficient |
| | Green light ON | The power supply for solenoids is normal |
| PWR | OFF | The power supply for input and control is insufficient |
| | Green light ON | The power supply for input and control is normal |
| MS | OFF | The power supply for control is OFF |
| | Green light ON | Operating normally |
| | Green flashing | Setting error (Device has not been configured) |
| | Red flashing | Recoverable internal error |
| | Red light ON | Unrecoverable internal error |
| NS | OFF | The power supply for control is OFF or IP address not set |
| | Green flashing | EtherNet/IP-level communication not established |
| | Green light ON | Multiple EtherNet/IP-level communications established |
| | Red flashing | Multiple EtherNet/IP-level communications time out |
| | Red light ON | IP address duplicated |

## ●Switch setting

Open the switch protective cover and set the switches with a sharp-pointed watchmakers screwdriver etc.

**NOTE**
1. Be sure to turn off the power before setting the switches.
2. Be sure to set these switches before use.
3. After setting the switch, close the switch protective cover and tighten the screws with the proper tightening torque. (Tightening torque : 0.6N·m)




IP address
192.168.0.X

| SW1 | | | | X |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | |
| 0 | 0 | 0 | 0 | Remote control *1 |
| 1 | 0 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 2 |
| 1 | 1 | 0 | 0 | 3 |
| · | · | · | · | · |
| 0 | 1 | 1 | 1 | 14 |
| 1 | 1 | 1 | 1 | DHCP mode *2 |

Manual set up of IP address *3

Communication setting

| SW1 | | | Item | Contents |
|---|---|---|---|---|
| 5 | 6 | 7 | | |
| 0 | - | - | Communication setting | AUTO : The communication setting is automatically selected. |
| 1 | - | - | | MANUAL : The communication setting follows the setting result by the switch No. 6 and 7. |
| 1 | 0 | - | Communication speed | Communicated at 10Mbps |
| 1 | 1 | - | | Communicated at 100Mbps |
| 1 | - | 0 | Communication method | Communicated at half duplex |
| 1 | - | 1 | | Communicated at full duplex |

CLEAR/HOLD

| SW1 | Contents |
|---|---|
| 8 | |
| 0 | The output signal is cleared when the communication error occurs. |
| 1 | The output signal is held when the communication error occurs. |

*1 : Remote control (SW1 Dip Switches 1 to 4 off)

SMC's EX250 SI Unit will respond to the following Rockwell Automation BOOTP/DHCP Server commands.

Enable DHCP

Selecting this function will enable the EX250 SI Unit to retrieve its boot information from the BOOTP/DHCP Server. If DHCP is enabled the EX250 SI Unit will retrieve its boot information during the next power up.

Disable BOOTP/DHCP

Selecting this function will disable the EX250 to retrieve its boot information from the BOOTP/DHCP Server, and causes the EX250 to retain its current configuration during the next power up.

*2 : DHCP Mode (SW1 Dip Switches 1 to 4 on)

The IP address is acquired via DHCP Server. The IP address is not saved and lost if the power to the EX250 unit is cycled.

*3 : Hardware Addressing

The IP address range is 192.168.0.1-192.168.0.14.

**Default settings**

At the time of factory shipment, the product is in "Remote Control Mode" and set to "Enable DHCP".

**NOTE**
If the stored IP address of an EX250 is not known, please go to the "DHCP Mode" section.

# Input Block Model Indication Method

**●Input Block**
**Model indication method**

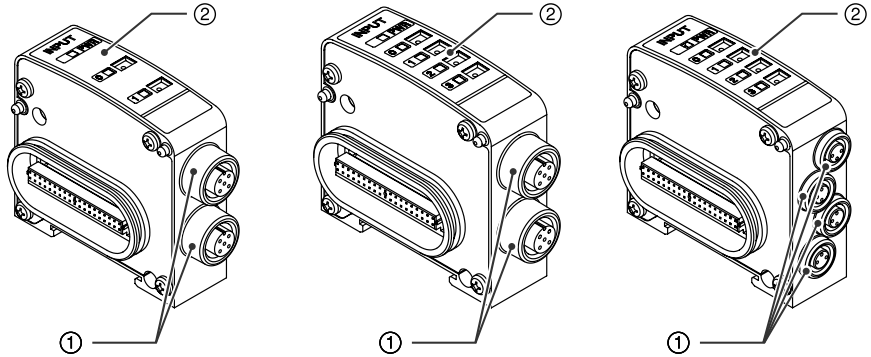
**EX250 − IE□**

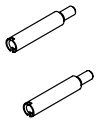
Block type

| | |
|---|---|
| 1 | Input points : 2, M12 connector (2pcs.) |
| 2 | Input points : 4, M12 connector (2pcs.) |
| 3 | Input points : 4, M8 connector (4pcs.) |

# Part Names

EX250-IE1 EX250-IE2 EX250-IE3



Tie-rod (2 pcs.)
Accessory

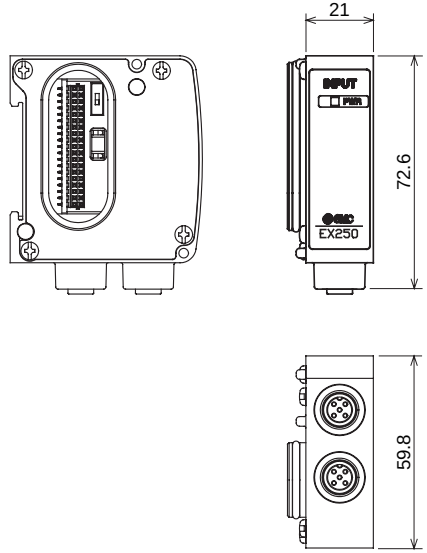
| No. | Part names | Application |
|---|---|---|
| 1 | Input equipment connector | Connects the input equipment such as sensor, etc. Note1 |
| 2 | Operation display LED | Displays the power source and input status. Note2 |

Note1 : For wiring method, refer to subsection "Wiring" (page 20) of section "Input Block" in this manual.
Note2 : For display and setting, refer to "Display/Setting" (page 22) in section "Input Block" in this manual.

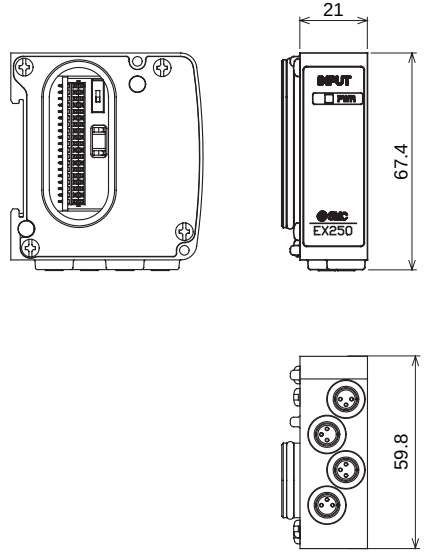


# Dimensions ( unit : mm )

EX250-IE1/2




EX250-IE3




# Mounting/Installation

**Refer to subsection "Mounting/Installation" (page 7) in this manual.**

# Specifications

| | | |
|---|---|---|
| Applicable sensor | Current source type(PNP input)<br>Current sink type(NPN input) *Selected with a switch. | |
| Rated voltage | 24VDC (It can have a voltage drop for 1V at max. to the power source voltage of the SI Unit.) | |
| Logical "1" input voltage VH | 11 to 30V | |
| Logical "0" input voltage VL | -3 to +5V | |
| Logical "1" input current IH | 8mA Typ. | |
| Connection of 2-wire sensor | Possible | |
| Logical "1" input current IL | Max.2.5mA | |
| Input delay time | 3msec. Typ. | |
| Supply current to sensor | Max. 120mA / Input Block | |
| Connector type of the input equipment | IE1/2 | M12 connector (4 pin, plug or 5 pin, plug) |
| | IE3 | M8 connector (3 pin, plug) |

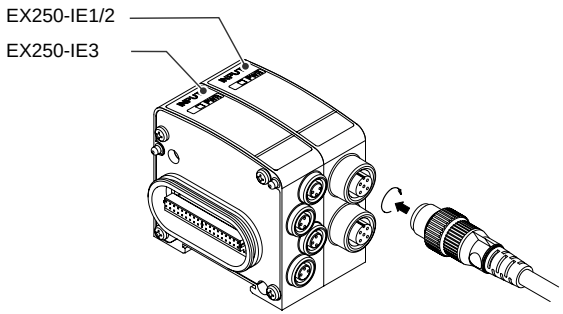
# Wiring

## ①Input wiring

### Cable wiring

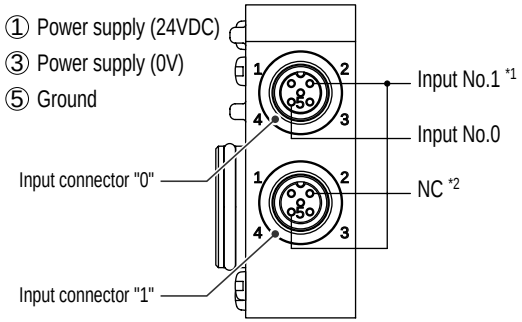
EX250-IE1/2/3

(1) Aligning the key groove with the input connector (socket) of Input Block, plug in the cable (plug).
(2) Tighten the lock nut on cable side by turning it clockwise by hand.
(3) Confirm that the connector does not move.

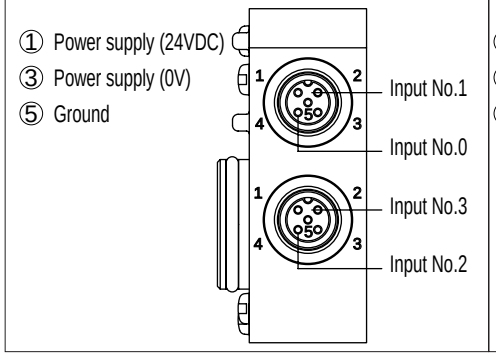
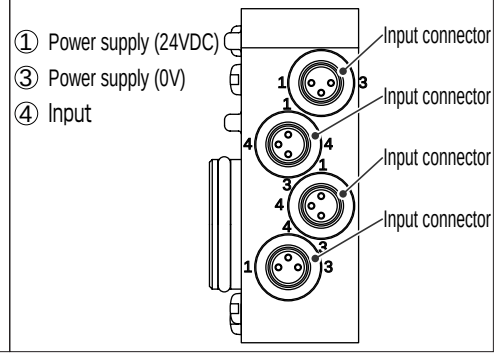



### ●Input connector pin layout

EX250-IE1
(M12 connector, 5 pin, Socket)




*1) Input No.1 is connected to the pin No.2 of the input connector "0", 2 input signals can be directly input from the input connector "0".
*2) NC : Not connected

| EX250-IE2<br>(M12 connector, 5 pin, Socket) | EX250-IE3<br>(M8 connector, 3 pin, Socket) |
|---|---|
|  |  |



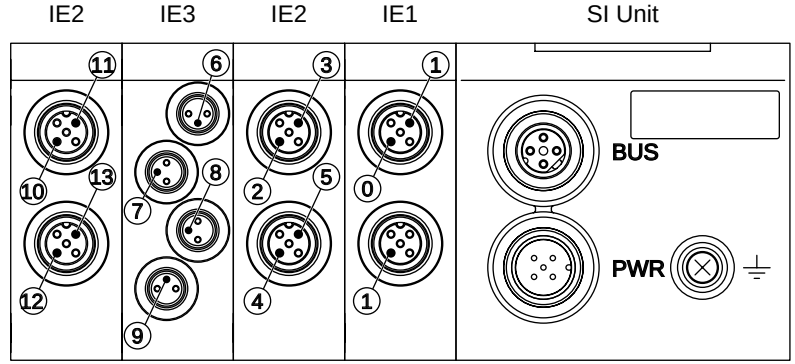


• Be sure to check the specifications of the input signal when wiring the sensor.It may cause the malfunction.Mind the position of the mounting key when selecting the sensor.

**NOTE**
Mount a Waterproof Cap on each unused connector of Input Block. The proper use of Waterproof Cap can achieve IP67 Enclosure. (Tightening torque : 0.1N·m for M12)
For Waterproof Cap, refer to "Option" (page 32) in this manual.

### ●Correlation between input number and Input Block

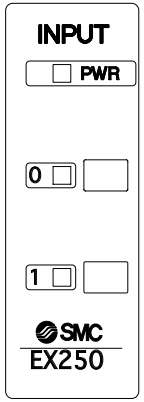
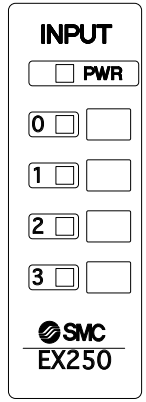
The total number of Input and Output Blocks can not exceed 10.
The maximum input point is 32.




The input number is 1, 2 ...32 from the SI Unit side.

# Display/Setting

## ●Display

| EX250-IE1 | EX250-IE2/IE3 |
|---|---|
|  |  |

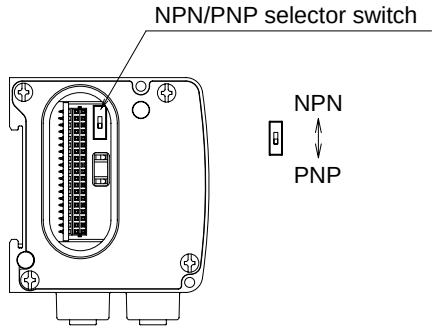




| Display | Description | |
|---|---|---|
| PWR | Lights up | Power supply for sensor is ON. |
| | Off | Power supply for sensor is OFF. |
| 0, 1, 2, 3 | Lights up | Sensor signal input corresponding to the number is ON. (Logic "1") |
| | Off | Sensor signal input corresponding to the number is OFF. (Logic "0") |

## ●Switch setting

- Applicable sensor to the Input Block can be switched to NPN/PNP.
- Remove the Input Block according to the "Mounting/Installation" (Page 7) in this operation manual, then set up the switch with a sharp-pointed watchmakers screw driver etc.
- Install the Input Block after the setting according to "Mounting/Installation" (Page 7) in this operation manual.






# EX9 Series Output Block/Power Block Model Indication Method

The EX9 series General Purpose Output Block is the unit to operate various output (solenoid valve, relay, etc.) in combination with valve and SI Unit.
There are two types — one type is for low wattage load (EX9-OET1) receiving power supply from SI Unit, and the other type is for high wattage load (EX9-OEP1) receiving power supply from an external source. NOTE)
The type for high wattage load is used in combination with the Power Block (EX9-PE1) connected with external power supply.
As the low wattage load type is powered from SI Unit, the wattage of load is limited to 1.5W NOTE). For a load up to 12W, use the Power Block and the high wattage load type.

**NOTE**
+COM. type EX9-OET/P2 cannot be connected to EX250-SEN1.

## ●Output Block

**EX9 – OE□1**

Output specification

| | |
|---|---|
| 1 | PNP output (-COM.) |

Power supply type

| | |
|---|---|
| T | Internal power supply type (for low wattage load) |
| P | External power supply type (for high wattage load)* |

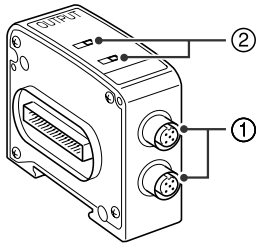
* It is connected to the Power Block while its operation.

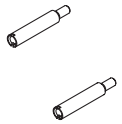
## ●Power Block

**EX9 – PE1**

# Part Names

## ●Output Block



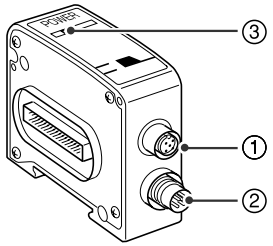



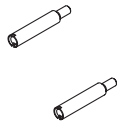
Tie-rod (2 pcs.)
Accessory

| No. | Part names | Application |
|---|---|---|
| 1 | Output equipment connector | Connects with output device. Note1) |
| 2 | Operation display LED | Indicates the output status. Note2) |

Note1 : For wiring method, refer to subsection "Wiring" (page 26) of section "EX9 Series Output Block/Power Block" in this manual.
Note2 : For display, refer to subsection "Display" (page 30) of section "EX9 Series Output Block/Power Block" in this manual.

## ●Power Block



Tie-rod (2 pcs.)
Accessory

Waterproof cap
(for socket)(1 pc.)

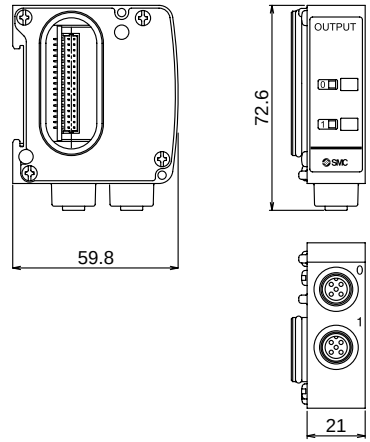
| No. | Part names | Application |
|---|---|---|
| 1 | Power supply connector | Power can be supplied to SI Unit when connecting SI Unit next to Power Block. Note1) |
| 2 | Power input connector | Supplies power for output devices. Note1) |
| 3 | Operation display LED | Indicates the power supply status. Note2) |

Note1 : For wiring method, refer to subsection "Wiring" (page 28) of section "EX9 Series Output Block/Power Block" in this manual.
Note2 : For display, refer to subsection "Display" (page 30) of section "EX9 Series Output Block/Power Block" in this manual.

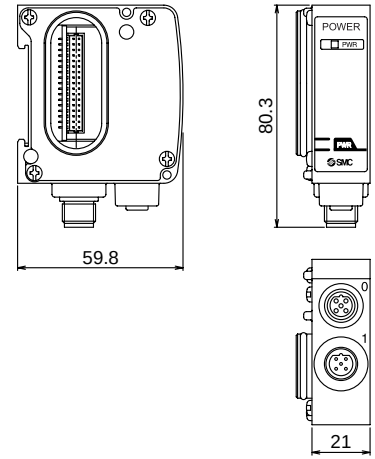


# Dimensions ( unit : mm )

## ●Output Block




## ●Power Block




# Mounting/Installation

**Refer to subsection "Mounting/Installation" (page 7) in this manual.**

# Specifications

## ●Output Block

| Model No. | EX9-OET1 | EX9-OEP1 |
|---|---|---|
| Power supply type | Internal power supply type | External power supply type (Supplied from the Power Block, EX9-PE1.) |
| Rated voltage | 24VDC | |
| Output method | PNP output (-COM.) | |
| Rated load current | Max. 62mA/point | Max. 0.5A/point NOTE) |

* It is limited to the max. Power Block supply current 3.1A.

**NOTE**
When connecting an inductive load such as a solenoid valve or relay without built-in surge suppressor, the use of an external surge suppressor is recommended.

## ●Power Block

| | |
|---|---|
| Power supply voltage range | 24VDC+10%/-5% |
| Output method | PNP output (-COM.) |
| Supply current | Max. 3.1A<br>(When it is operated with the current between 3.0A and 3.1A, the ambient temperature should be 40 deg.C or lower and the cables should not be bundled.) |

# Wiring

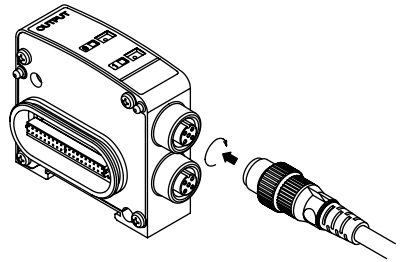
## ①Output wiring

### Cable wiring

(1) Aligning the key groove with the output connector (socket) of Output Block, plug in the cable with connector (plug).

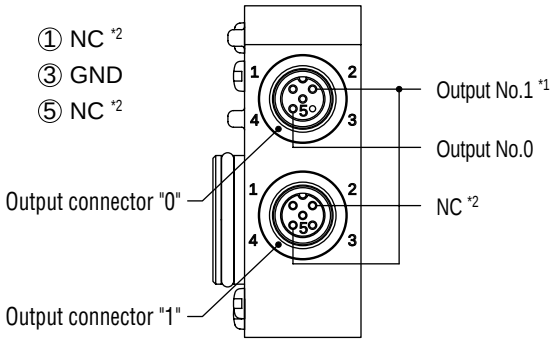
(2) Tighten the lock nut on cable side by turning it clockwise by hand.

(3) Confirm that the connector does not move.



## ●Output connector pin layout

EX9-OET1, EX9-OEP1
(M12 connector, 5 pin, Socket)



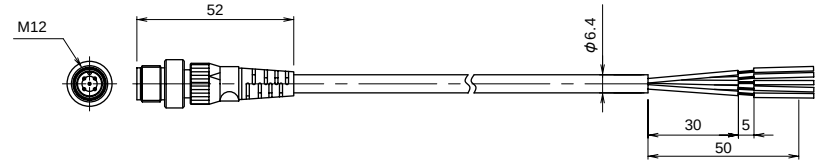

*1) Output No.1 is connected to the pin No.2 of the output connector "0", and 2 output signals can be directly output from the output connector "0".

*2) NC : Not connected



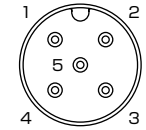


### Pin alignment and connection drawing of the Output Cable




Model No. : EX9-AC☐-7

| Pin No | Cable color: Signal name |
|---|---|
| 1 | Brown : NC |
| 2 | White : Output No.1/NC |
| 3 | Blue : GND |
| 4 | Black : Output No.0/Output No.1 |
| 5 | Grey : NC |

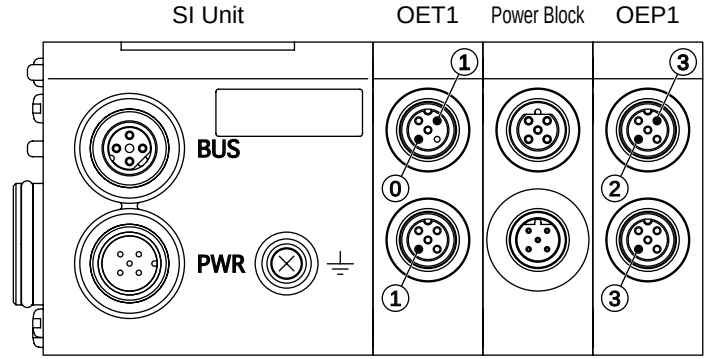



Plug connector pin layout

**NOTE**
Mount a Waterproof Cap on each unused connector of Output Block.The proper use of Waterproof Cap can achieve IP67 Enclosure. (Tightening torque : 0.1N·m for M12) For Waterproof Cap, refer to "Option" (page 32) in this manual.

## ●Correlation between output number and Output Block

The total number of Input and Output Blocks can not exceed 10.




The output number is 1, 2 ... from the SI Unit side.

## ②**Power supply wiring** (Power Block)

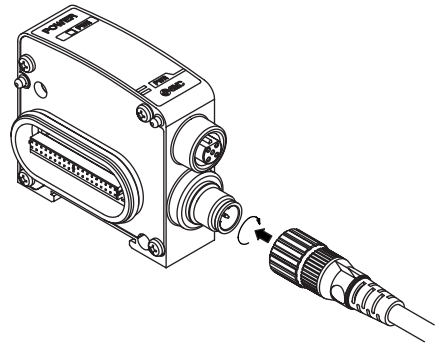
When operating EX9-OEP1, combine it with EX9-PE1, and connect the power supply to the power input connector of EX9-PE1.

### Cable wiring

(1) Aligning the key groove with the connector of Power Block, plug in the cable.

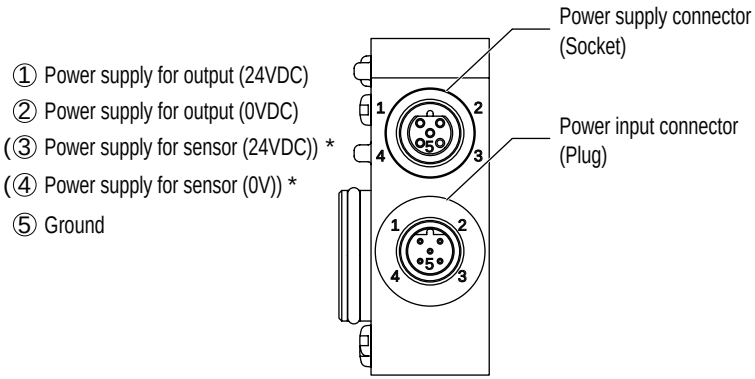
(2) Tighten the lock nut on cable side by turning it clockwise by hand.

(3) Confirm that the connector does not move.



### ●EX9-PE1 pin layout

M12 connector, 5 pin, Reverse key

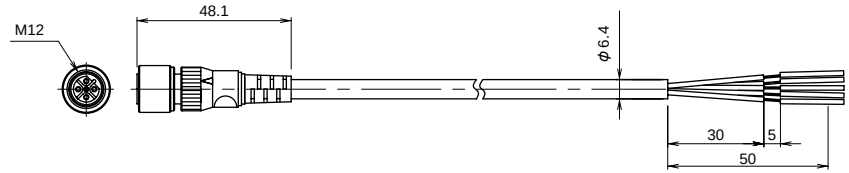



* It is used when power is supplied to SI Unit, using an exclusive cable from the power supply connector.
When power is not supplied to the SI Unit from the Power Block, it is not required to connect the power to the pins No. ③ and ④ of the power input connector.



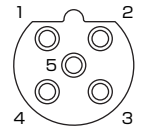
### Pin alignment and connection drawing of the Power Supply Cable

### ●**Power Cable** (Power Block)



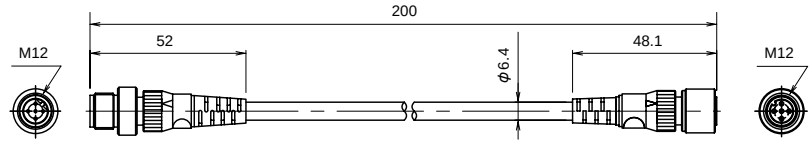

Model No. : EX9-AC□-1

| Pin No | Cable color: Signal name |
|---|---|
| 1 | Brown : Power supply for output (24VDC) |
| 2 | White : Power supply for output (0V) |
| 3 | Blue : (Power supply to sensor (24VDC)) |
| 4 | Black :(Power supply to sensor (0V)) |
| 5 | Grey : Earth |

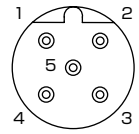



Socket connector pin layput ( Reverse key )

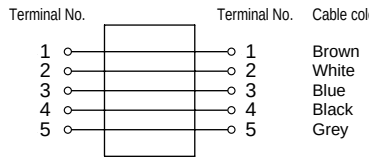
### ●**Power Cable Jumper** (Power Block to EX250-SEN1)



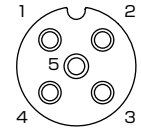

Model No. : EX9-AC002-3




Plug connector pin layput ( Reverse key )



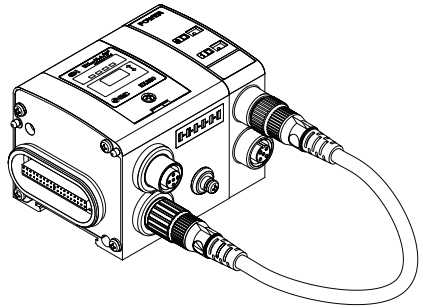

Wiring diagram




Socket connector pin layout

## Wiring ( continued )

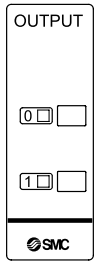
The Power Supply Cable (for Power Supply Connector of Power Block) is a bypass cable which can be used when the Power Block is positioned next to the SI Unit.



**NOTE**
Mount a Waterproof Cap on unused Power Supply Connector. The proper use of Waterproof Cap can achieve IP67 Enclosure. (Tightening torque : 0.1N·m for M12)
For Waterproof Cap, refer to "Option" (page 32) in this manual.

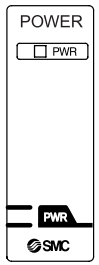
# Display

### ●Output Block




| Display | Description | |
|---|---|---|
| 0,1 | Lights up | Output corresponding to the number is ON. |
| | Off | Output corresponding to the number is OFF. |

### ●Power Block




| Display | Description | |
|---|---|---|
| PWR | Lights up | External power supply is ON. |
| | Off | External power supply is OFF. |



# Option

① Ethernet Communication Cable
For details, refer to subsection "Wiring" (page 12) in section "SI Unit" in this manual.
How to order

EX9-AC 020 EN- PSRJ

Cable length ( L )

| | |
|---|---|
| 020 | 2 [m] |

Connector specification

| | |
|---|---|
| PSRJ | M12 plug ( straight ) ↔ RJ45 connector |

② Power Supply Cable
For details, refer to subsection "Wiring" (page 13) of section "SI Unit" in this manual.
How to order

EX500-AP 050 - S

Cable length (L)

| | |
|---|---|
| 010 | 1 [m] |
| 050 | 5 [m] |

Connector specification

| | |
|---|---|
| S | Straight |

③ Spare Fuse (for Input Block)
How to order

EX9-FU 05

Rating ( A )

| | |
|---|---|
| 05 | 0.5A |

④ Output Cable
For details, refer to subsection "Wiring" (page 26) of section "EX9 series Output Block/Power Block" in this manual.
How to order

EX9-AC 010 -7

Cable length ( L )

| | |
|---|---|
| 010 | 1 [m] |
| 030 | 3 [m] |

⑤ Power Supply Cable (for power input connector of Power Block)
For details, refer to subsection "Wiring" (page 29) of section "EX9 series Output Block/Power Block" in this manual.
How to order

EX9-AC 010 -1

Cable length ( L )

| | |
|---|---|
| 010 | 1 [m] |
| 030 | 3 [m] |
| 050 | 5 [m] |

⑥ Power Supply Cable (for power supply connector of Power Block)
For details, refer to subsection "Wiring" (page 29) of section "EX9 series Output Block/Power Block" in this manual.
How to order

EX9-AC 002 -3

Cable length (L)

| | |
|---|---|
| 002 | 0.2 [m] |

## Option ( continued )

⑦ End Plate (Input Block side)

How to order

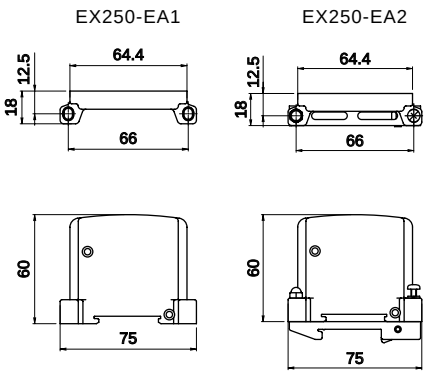
EX250-EA1

Mounting method

| | |
|---|---|
| 1 | Standard product |
| 2 | For DIN rail mounting |

Accessory

Hexagon thin socket head bolt (2 pcs.)



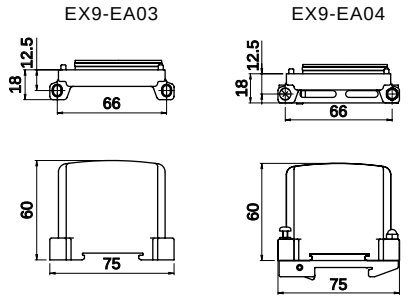

⑧ End Plate R (Output Block side)

How to order

EX9-EA03

Mounting method

| | |
|---|---|
| 03 | Standard product |
| 04 | For DIN rail mounting |




⑨ Waterproof Cap

Mounted on the unused ports of the Input Block, Output Block and Power Block.
The proper use of this Waterproof Cap can achieve IP67 Enclosure. (The Waterproof Caps are delivered together with the Power Block as accessories.)

How to order

EX500-AW□

Connector specification

| | |
|---|---|
| ES | M8 connector ( for socket ) / 10 pcs. |
| TS | M12 connector ( for socket ) / 10 pcs. |

**NOTE**
Tighten the Waterproof Cap by the specified tightening torque. (0.05N•m for M8, 0.1N•m for M12)



# Troubleshooting

## ●Overall system

| No. | Item | Solution/Corrective action |
|---|---|---|
| 1 | Solenoid valve does not work | • Check the power for output (24VDC) is supplied.<br>• Check that the connectors are properly connected.<br>• Check the communication status of EtherNet/IP. |
| 2 | Solenoid valve does not work as programmed | • Check the wiring specification for manifold block assembly and modify the program. |
| 3 | No input signal even though connected with sensor(s) | • Check the power for input and control (24VDC) is supplied.<br>• Check that the connectors are properly connected.<br>• Check indicator LED of each Input Block light ON.<br>• Check the communication status of EtherNet/IP.<br>• Check the sensor type (PNP/NPN). |
| 4 | Output equipment connected to the Output Block does not operate. | • Check that the output power (24VDC) is supplied.<br>• For the high wattage load type, check that the external power (24VDC) is supplied from the Power Block.<br>• Check that the Output Block is applicable to PNP.<br>• Check that the connectors for connection are properly connected.<br>• Check that the connected load does not exceed the rated load.<br>• Check the communication status of EtherNet/IP. |

## Troubleshooting ( continued )

### ●EtherNet/IP compatible communication

| No. | Item | Solution/Corrective action |
|---|---|---|
| 1 | MS LED status<br>Normal status : Green light ON<br>Fatal failure : Red light ON | • The effect of noise is possible. Check the installation conditions. If the trouble cannot be solved even if the installation conditions are checked, contact our sales branch. |
| 2 | NS LED status<br>Offline/Power is OFF : Light OFF<br>Online/Communication is not established : Green flashing<br>Online/Communication is established : Green light ON<br>Minor communication error occurred : Red flashing<br>Fatal communication error occurred : Red light ON | • Check the signal line from PLC is connected.<br>• Check the wiring and pin number.<br>• Check the data rate and address setting. |
| 3 | SOL LED light OFF | • Check the power for solenoid valves/output (24VDC) is supplied.<br>• Check the power supply voltage for solenoid valves/output does not drop under 20V. |
| 4 | PWR LED light OFF | • Check the power for input and control (24VDC) is supplied. |